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**CLAIMS**

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[Claim(s)]

[Claim 1]In a reciprocation type pump (1) with which it was made to be carried out in inhalation regurgitation of a fluid by a reciprocating member (20), A reciprocation type pump attaching a malfunction detection means (50) which becomes the inhalation regurgitation of a fluid from a piezoelectric device which detects pressure fluctuation of the discharge side (40) that it should be detected whether abnormalities arose or not.

[Claim 2]The reciprocation type pump according to claim 1, wherein the aforementioned piezoelectric device (50) is made ring shape thru/or tubed and outer fitting is carried out to an exit passage component (40) which is a discharge side of the aforementioned pump (1).

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**DETAILED DESCRIPTION**

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[Detailed Description of the Invention]

[0001]

[Field of the Invention]This invention relates to the reciprocation type pump it is made to have the inhalation regurgitation of a fluid performed by reciprocating members, such as a piston and a plunger, and relates to what attached the malfunction detection means for detecting the abnormalities that a fluid is not inhaled in particular and that regurgitation feeding is not carried out to the destination.

[0002]

[Description of the Prior Art]The reciprocation type pump used for the lubrication etc. of the small air-cooling two-cycle gasoline engine (an internal combustion engine is called hereafter) used as the source of power of portable work machines, such as a chain saw, has composition as shown, for example in drawing 7. Hereafter, the reciprocation type pump 2 of a graphic display conventional example is explained briefly. The body part 60 to which inner fitting of the cylinder part 65 in which, as for this reciprocation type pump 2, the admission port 66 and the delivery 67 opened and closed by the ball valve body 75 were formed fundamentally was carried out, The reciprocating member 70 which the rear end part of the plunger rod 71 slidably fitted in the aforementioned cylinder part 65 and this plunger rod 71 becomes from the plunger body 72 by which press fit immobilization was carried out, It has the solenoid 80 which drives the aforementioned reciprocating member 70 allocated in the one end side (a figure right-hand side) of the aforementioned body part 60, and the exit passage component 90 you were made to screw in the other end side (a figure left-hand side screwing part 64) of the aforementioned body part 60.

[0003]The aforementioned ball valve body 75 is energized in the direction which always closes the aforementioned delivery 67 with the carp spring 74 infixed between it and the aforementioned exit passage component 90.

The aforementioned reciprocating member 70 is energized rightward [ of a figure ] by the coil spring 78 infixed between the aforementioned cylinder part 65 and the aforementioned plunger body 72, and is.

[0004]The aforementioned solenoid 80 is inserted between the aforementioned body part 60 and the mounting-and-fixing pipe 84 you were made to screw in the end side periphery, and mounting and fixing is made and carried out.

Externally fitting and fixing of the stopper covering 85 of closed-end cylindrical shape is carried out to the periphery side of the aforementioned mounting-and-fixing pipe 84.

[0005]The aforementioned solenoid 80 is turned on / (energization magnetization) turned off by drive pulse supplied with a predetermined cycle from a power supply (control device) of the exterior which is not illustrated.

If the aforementioned solenoid 80 is turned OFF from ON, the aforementioned reciprocating member 70, It is made to move rightward [ of a figure ] by energization force of the aforementioned coil spring 78, and the aforementioned PURAJA rod 71 opens the aforementioned admission port 66, While inhaling a fluid (oil for internal combustion engine lubricous) in the valve chest 61 formed between the aforementioned plunger rod 71 and the aforementioned ball valve body 75, the back end collar-like part 73 is made to \*\*\*\* to the aforementioned stopper covering 85 (state shown as a solid line of a figure).

[0006]If the aforementioned solenoid 80 is turned ON from this state, while the aforementioned reciprocating member 70 will be made to move leftward [ of a figure ] by that generating magnetism and the aforementioned PURAJA rod 71 will close the aforementioned admission port 66, The fluid in the aforementioned valve chest 61 is pressed, the aforementioned ball valve body 75 is pushed leftward [ of a figure ], and the aforementioned back end collar-like part 73 of the aforementioned plunger body 72 is made to \*\*\*\* to the impingement baffle 88 made of a synthetic resin stuck on the right end surface of the aforementioned mounting-and-fixing pipe 84. Thereby, the aforementioned delivery 67 is opened and the fluid in the aforementioned valve chest 61 is breathed out at the aforementioned exit passage component 90 side.

[0007]Therefore, while the oil for lubricous in the oil tank which is not illustrated is inhaled by the aforementioned valve chest 61 from the aforementioned admission port 66 via an oil strainer, a suction pipe, etc. by the ON/OFF operation of the aforementioned solenoid 80, for example, Via the check valve 95 allocated in the outlet side of the exit passage 92 currently formed so that it may run through the aforementioned delivery 67, the aforementioned ball valve body 75, and the aforementioned exit passage component 90 from this valve chest 61,

and this exit passage 92, the discharge pipes connected to the aforementioned exit passage component 90, etc., Regurgitation feeding is carried out at the sliding portion of the aforementioned internal combustion engine which is a destination. The mark 68 in a figure is an insertion section of the power cord which supplies a drive pulse to the aforementioned solenoid 80 and which is not illustrated.

[0008]

[Problem to be solved by the invention]By the way, in a reciprocation type pump which was described above, oil (fluid) is no longer normally inhaled with plugging of an inlet side, an oil piece (suction of air), etc., Or when plugging arises for piping of an outlet side and abnormalities -- oil is no longer sent to the destination -- arise, to take measures, such as, stopping the aforementioned internal combustion engine for example, that seizure should be prevented and alarming, is desired.

[0009]Therefore, conventionally, a pressure sensor is attached to the aforementioned reciprocating pump, and it considers detecting abnormalities which were described above with this pressure sensor based on the output (detecting signal) of nothing and this pressure sensor so that the pressure fluctuation of that discharge side might be detected.

[0010]As shown in drawing 7, the output port 97 is established in the aforementioned exit passage component 90, and, specifically, it is detected with nothing and this pressure sensor 100 that the pressure fluctuation of that discharge side introduces a part of oil (discharge pressure) of a discharge side into the pressure sensor 100 via rigid pipe 98 grade, for example.

[0011]The thing of the indirect transformation which changes a pressure into other physical quantity (displacement etc.) with a diaphragm etc. conventionally, and takes out an electrical signal as the aforementioned pressure sensor 100 is common, For example, the thing etc. of the system which formed the capacitor of the couple by what stuck the strain gage on the diaphragm, the thing which carried out symmetrical arrangement of a coil and the core to both sides of the diaphragm of a magnetic material, and constituted the magnetic circuit [ \*\*\*\* ], and a conductive diaphragm and the electrode which counters this are marketed.

[0012]The output of the aforementioned pressure sensor 100 synchronizes with ON/OFF (regurgitation and inhalation operation by the aforementioned reciprocating member 70) of the aforementioned solenoid 80 here, as shown in drawing 8, When [ normal ] abnormalities which were described above have not arisen, Become a waveform as shown in drawing 8 (A), and at the time of an oil piece, As shown in drawing 8 (B), while the stage when change of an output appears is a little (air sink sake) late for the time of normal, when an output becomes small a little and plugging etc. arise in an outlet side, an output becomes very large as shown in drawing 8 (C). Therefore, the classification of the above-mentioned abnormalities is detectable by processing the output (detecting signal) of this pressure sensor 100 by computer.

[0013]However, a pressure sensor which was described above and which is generally marketed, The reciprocation type pump used for the lubrication etc. of the internal combustion engine used as the source of power of portable work machines, such as a chain saw, If it carries out for using as a detection means for detecting abnormalities, such as an oil piece and plugging of an outlet side, Since restrictions were imposed on a place, a space, etc. which there is too expensive a tendency and need to lead fluids (discharge pressure), such as direct oil, to a pressure sensor and in which it is installed, it was difficult actually to attach the aforementioned pressure sensor to the aforementioned reciprocating pump.

[0014]There is a place which was made so that this invention may meet the request which was described above, and is made into the purpose in providing the reciprocation type pump it enabled it to detect certainly under comparatively easy composition in the abnormalities of the inhalation regurgitation of fluids, such as an oil piece and plugging of an outlet side, using an inexpensive detection means.

[0015]

[Means for solving problem]The reciprocation type pump concerning this invention is characterized by attaching the malfunction detection means which consists of a piezoelectric device which detects the pressure fluctuation of the discharge side that it is made to be performed in the inhalation regurgitation of a fluid by the reciprocating member, and it should be detected whether abnormalities arose in the inhalation regurgitation of the fluid that the aforementioned purpose should be attained. Preferably, the aforementioned piezoelectric device is made ring shape thru/or tubed, and outer fitting is carried out to the exit passage component which is a discharge side of the aforementioned pump.

[0016]In a concrete desirable mode, the reciprocation type pump concerning this invention, While being made to reciprocate the inside of the body part which has the cylinder part in which the admission port and the delivery opened and closed by the valve were formed, and the aforementioned cylinder part and inhaling a fluid from the aforementioned admission port, The aforementioned reciprocating member which extrudes the inhaled fluid from the aforementioned delivery to an exit passage, and the solenoid which drives this reciprocating member are provided.

[0017]In this case, outer fitting of the aforementioned piezoelectric device is preferably carried out to the aforementioned exit passage component, compression maintenance is carried out between the collar-like part and the aforementioned body part which were provided in this exit passage component, and an insulating member is infixed in a still more desirable mode between the aforementioned piezoelectric device, the aforementioned exit passage component, and the aforementioned body part. The fluid which carries out the inhalation regurgitation is suitable for the reciprocation type pump concerning this invention for using it as a lubricating oil pump which is the oil for internal combustion engine lubricous.

[0018]In the desirable mode of the reciprocation type pump concerning this invention considered as composition which was described above, This piezoelectric device to the inhalation regurgitation of a fluid, using ring shape thru/or a tubed piezoelectric-device simple substance as a malfunction detection means to detect whether abnormalities arose or not in a desirable mode, Outer fitting is carried out to the aforementioned exit passage component, and compression maintenance is carried out by the basis which infixed the insulating member between the collar-like part and the aforementioned body part which were provided in this exit passage component.

[0019]By this by the pressure fluctuation of the fluid of the discharge side of a fluid by which the inhalation regurgitation is carried out with the aforementioned reciprocation type pump, For example, the aforementioned exit passage component carries out pinch-and-swell, the deforming force is transmitted to the aforementioned piezoelectric device via the aforementioned exit passage component and the aforementioned insulating member, this piezoelectric device is made to expand and contract by this, and the output (detecting signal) changes according to the aforementioned pressure fluctuation.

[0020]In this case, if the output of the aforementioned piezoelectric device becomes the fundamentally same thing as the output of the above-mentioned pressure sensor, therefore the output of the aforementioned piezoelectric device is processed by computer etc., it can detect automatically the classification of abnormalities, such as an oil piece and plugging of an outlet side.

[0021]Here the aforementioned ring shape thru/or a tubed piezoelectric device, very easy, since what is necessary is for it to be very inexpensive, and to be marketed as compared with the above-mentioned pressure sensor, and not to lead fluids (discharge pressure), such as direct oil, to the aforementioned piezoelectric device, to carry out outer fitting of the attachment, for example to an exit passage component further, and just to carry out compression maintenance between it and a body part -- it is easy. Thus, according to this invention, the abnormalities of the inhalation regurgitation of fluids, such as an oil piece and plugging of an outlet side, are certainly detectable under comparatively easy composition using an inexpensive piezoelectric device.

[0022]On the other hand, it comprises an another desirable mode of the reciprocation type pump concerning this invention so that direct transmission of the pressure variation of the fluid breathed out from the aforementioned delivery may be carried out to the aforementioned piezoelectric device as the aforementioned malfunction detection means. In this case, the exit passage component connected with the aforementioned delivery side is preferably made tubed [ the passage and pressure detection room was made to penetrate by the inside ], and mounting and fixing of the aforementioned piezoelectric device is carried out to that periphery side.

[0023]The body part which has the cylinder part in which the admission port and the aforementioned delivery were formed in a still more concrete desirable mode, While being made to reciprocate the aforementioned exit passage component connected with the aforementioned delivery side of this body part via the first pressure regulating valve, the second pressure regulating valve allocated in the downstream of this exit passage component, and the inside of the aforementioned cylinder part and inhaling a fluid from the aforementioned admission port, While providing the aforementioned reciprocating member which extrudes the inhaled fluid from the aforementioned delivery to the aforementioned passage and pressure detection room, and the solenoid which drives this reciprocating member and setting up more highly than the pressure regulation value of the first above-mentioned pressure regulating valve the pressure regulation value of the second above-mentioned pressure regulating valve, It is made as [ carry out / to the aforementioned piezoelectric device / direct transmission of the pressure variation of the fluid of the aforementioned passage and pressure detection room ].

[0024]In the desirable mode of the reciprocation type pump considered as such composition, Since direct transmission of the pressure variation of the fluid breathed out from a delivery is carried out to a piezoelectric device, Like the above-mentioned mode, when it is made to transmit the deforming force by pinch-and-swell [ of an exit passage component ] to a piezoelectric device that is, as compared with the case where it is made to transmit the pressure variation of a fluid to a piezoelectric device indirectly, the aforementioned piezoelectric device reacts sensitively to the pressure variation of a fluid.

[0025]Although the pressure variation of a fluid may be absorbed into the flexible hose etc. which are connected to the aforementioned exit passage component and the output change of the aforementioned piezoelectric device was small and weak in the mode which carries out outer fitting of the above-mentioned ring shape thru/or tubed piezoelectric device to an exit passage component, Like this mode, in addition to the first pressure regulating valve (what it usually has), the second pressure regulating valve is formed in an exit passage component, and sensitivity [ as opposed to the pressure variation of the fluid of the aforementioned piezoelectric device in it having been made to carry out direct transmission of the pressure variation of the fluid between them to the aforementioned piezoelectric device ] goes up. Therefore, in the reciprocation type pump of this mode, the certainty and accuracy of malfunction detection improve and reliability increases.

[0026]

[Mode for carrying out the invention]Hereafter, an embodiment of the invention is described, referring to Drawings. Drawing 1 is a sectional view showing a first embodiment of the reciprocation type pump concerning this invention. The reciprocation type pump 1 of a graphic display is what is used for the lubrication etc. of the small air-cooling two-cycle gasoline engine (an internal combustion engine is called hereafter) used as the source of power of portable

work machines, such as a chain saw, It has same composition as fundamentally as the reciprocation type pump 2 of the conventional example shown in drawing 7 mentioned above. [0027]The reciprocation type pump 1 of \*\*\*\*\* and a graphic display embodiment, The body part 10 to which inner fitting of the cylinder part 15 in which the admission port 16 and the delivery 17 opened and closed by the ball valve body 25 were formed was carried out, The reciprocating member 20 which the rear end part of the plunger rod 21 slidably fitted in the aforementioned cylinder part 15 and this plunger rod 21 becomes from the plunger body 22 by which press fit immobilization was carried out, It has the solenoid 30 which drives the aforementioned reciprocating member 20 allocated in the one end side (a figure right-hand side) of the aforementioned body part 10, and the exit passage component 40 you were made to screw in the other end side (a figure left-hand side screwing part 14) of the aforementioned body part 10.

[0028]The aforementioned ball valve body 25 is energized in the direction which always closes the aforementioned delivery 17 with the carp spring 24 infixed between it and the aforementioned exit passage component 40, and the aforementioned reciprocating member 20, By the coil spring 28 infixed between the aforementioned cylinder part 15 and the aforementioned plunger body 22, it is energized rightward [ of the figure ], and is.

[0029]The aforementioned solenoid 30 is inserted between the aforementioned body part 10 and the mounting-and-fixing pipe 34 you were made to screw in the end side periphery, and mounting and fixing is made and carried out, and externally fitting and fixing of the stopper covering 35 of closed-end cylindrical shape is carried out to the periphery side of the aforementioned mounting-and-fixing pipe 34.

[0030]The aforementioned solenoid 30 is turned on / (energization magnetization) turned off by the drive pulse supplied with a predetermined cycle from the power supply (control device) of the exterior which is not illustrated, If the aforementioned solenoid 30 is turned OFF from ON, the aforementioned reciprocating member 20, It is made to move rightward [ of a figure ] by the energization force of the aforementioned coil spring 28, and the aforementioned PURAJA rod 21 opens the aforementioned admission port 16, While inhaling a fluid (oil for internal combustion engine lubricous) in the valve chest 11 formed between the aforementioned plunger rod 21 and the aforementioned ball valve body 25, the back end collar-like part 23 is made to \*\*\*\* to the aforementioned stopper covering 35 (state shown as the solid line of a figure).

[0031]If the aforementioned solenoid 30 is turned ON from this state, while the aforementioned reciprocating member 20 will be made to move leftward [ of a figure ] by that generating magnetism and the aforementioned PURAJA rod 21 will close the aforementioned admission port 16, The fluid in the aforementioned valve chest 11 is pressed, the aforementioned ball valve body 25 is pushed leftward [ of a figure ], and the aforementioned back end collar-like

part 23 of the aforementioned plunger body 22 is made to \*\*\*\* to the impingement baffle 38 made of a synthetic resin stuck on the right end surface of the aforementioned mounting-and-fixing pipe 34. Thereby, the aforementioned delivery 17 is opened and the fluid in the aforementioned valve chest 11 is breathed out at the aforementioned exit passage component 40 side.

[0032]Therefore, while the oil for lubricous in the oil tank which is not illustrated is inhaled by the aforementioned valve chest 11 from the aforementioned admission port 16 via an oil strainer, a suction pipe, etc. by the ON/OFF operation of the aforementioned solenoid 30, for example, Via the check valve 45 allocated in the outlet side of the exit passage 42 currently formed so that it may run through the aforementioned delivery 17, the aforementioned ball valve body 25, and the aforementioned exit passage component 40 from this valve chest 11, and this exit passage 42, the discharge pipes connected to the aforementioned exit passage component 40, etc., Regurgitation feeding is carried out at the sliding portion of the aforementioned internal combustion engine which is a destination.

[0033]In addition to the aforementioned composition, by this embodiment, whether abnormalities arose in the inhalation regurgitation of the oil for lubricous as a malfunction detection means to detect, The commercial tubed piezoelectric device 50 between the collar-like part 43 which carried out outer fitting to the aforementioned exit passage component 40, and was provided in this exit passage component 40, and the collar-like part 13 provided in the aforementioned body part 10, Compression maintenance is carried out via the tubed inner circumference insulating member 55 and the disc-like end-face insulating members 56 and 57 so that performance of the aforementioned piezoelectric device 50 may not be spoiled by generating of leak etc.

[0034]The output (detecting signal) of this piezoelectric device 50 is taken out via the lead (not shown) which was silver-welded or was soldered to that end surface. This piezoelectric device 50 is pre-compressed by predetermined pressure between the aforementioned collar-like parts 43-13. The mark 18 in a figure is an insertion section of the power cord which supplies a drive pulse to the aforementioned solenoid 30 and which is not illustrated.

[0035]In the reciprocation type pump 1 of this embodiment considered as such composition, By pressure fluctuation in case the oil for lubricous is breathed out (when the aforementioned solenoid 30 is turned ON), The aforementioned exit passage component 40 carries out pinch-and-swell, the deforming force is transmitted to the aforementioned piezoelectric device 50 via the aforementioned exit passage component 40 and the aforementioned insulating members 55, 56, and 57, this piezoelectric device 50 is made to expand and contract by this, and the voltage (output) proportional to the degree (variation speed) of the elasticity occurs.

[0036]In this case, the output of the aforementioned piezoelectric device 50 fundamentally like [ as shown in drawing 2 ] the output (drawing 8) of the pressure sensor 100 of the above-

mentioned conventional example, When [ normal ] abnormalities which were described above have not arisen synchronizing with ON/OFF (regurgitation and inhalation operation by the aforementioned reciprocating member 20) of the aforementioned solenoid 30, Become a waveform as shown in drawing 2 (A), and at the time of an oil piece, As shown in drawing 2 (B), while the stage when change of an output appears is a little (air sink sake) late for the time of normal, when amplitude becomes small a little and plugging etc. arise in an outlet side, amplitude becomes very large as shown in drawing 2 (C). Therefore, abnormalities, such as an oil piece and plugging of an outlet side, are automatically detectable by processing the output (detecting signal) of this piezoelectric device 50 by computer.

[0037]As compared with the pressure sensor 100 of the above-mentioned conventional example, the front tubed piezoelectric device 50 is very inexpensive, and is marketed here, very easy, since what is necessary is not to lead fluids (discharge pressure), such as direct oil, to the aforementioned piezoelectric device 50, to carry out outer fitting of the attachment to the aforementioned exit passage component 40 further, and just to carry out compression maintenance between it and the aforementioned body part 10 -- it is easy. Thus, in the reciprocation type pump 1 of this embodiment, the abnormalities of the inhalation regurgitation of fluids, such as an oil piece and plugging of an outlet side, are certainly detectable under comparatively easy composition using an inexpensive piezoelectric device.

[0038]Drawing 3 is a sectional view showing a second embodiment of the reciprocation type pump concerning this invention. The reciprocation type pump 1' of a graphic display has same composition as fundamentally as the reciprocation type pump 1 of a first embodiment shown in drawing 1 mentioned above, it gives identical codes to the same functional division as a first embodiment, omits duplication explanation to below, and explains a point of difference to it preponderantly.

[0039]The reciprocation type pump 1' of this embodiment is constituted so that direct transmission of the pressure variation of the fluid breathed out from the delivery 117 may be carried out to the piezoelectric device 150 as a malfunction detection means. The exit passage component 140 connected with the aforementioned delivery 117 side is made tubed [ the passage and pressure detection room 141 was made to penetrate by the inside ], and mounting and fixing of the aforementioned piezoelectric device 150 is carried out to the periphery side.

[0040]The body part 10' which has in detail the cylinder part 115 in which the admission port 116 and the aforementioned delivery 117 were formed. The aforementioned exit passage component 140 connected with the aforementioned delivery 117 side of this body part 10' via the first pressure regulating valve 120, While being made to reciprocate the second pressure regulating valve 130 allocated in the downstream of this exit passage component 140, and the inside of the aforementioned cylinder part 115 and inhaling a fluid from the aforementioned

admission port 116, The aforementioned reciprocating member 20 which extrudes the inhaled fluid from the aforementioned delivery 117 to the aforementioned passage and pressure detection room 141, and the solenoid 30 which drives this reciprocating member 20 are provided.

[0041]The pump is usually equipped with the first above-mentioned pressure regulating valve 120, and it consists of the ball valve body 125 and the helical compression spring 124 which energizes this in the closed direction. To it, the second above-mentioned pressure regulating valve 130 was newly attached, and consists of the ball valve body 135 which opens and closes the second delivery 147 of the downstream end of the aforementioned passage and pressure detection room 141, and the helical compression spring 134 which energizes this in the closed direction. The joint member 145 for connecting hose is made to screw in downstream one end of the aforementioned exit passage component 140, the compression amount of the aforementioned helical compression spring 134 is adjusted on it by the amount of bell and spigots of this joint member 145, and, thereby, the pressure regulation value of the aforementioned pressure regulating valve 130 is set to it.

[0042]Here, the pressure regulation value of the second above-mentioned pressure regulating valve 130 is set up more highly than the pressure regulation value of the first above-mentioned pressure regulating valve 120. In other words, it is set up so that the direction of the pressure to which the second above-mentioned pressure regulating valve opens the second above-mentioned delivery 147 from the pressure which the first above-mentioned pressure regulating valve 120 opens aforementioned delivery 117 may become high.

[0043]As the section periphery of the aforementioned exit passage component 140 is shown in drawing 4 (A), it has double-sided parallel chamfering type, and insertion immobilization of the insertion part 162 of the holder 160 which holds the aforementioned piezoelectric device 150 to the intussusceptum 144 provided in the center-section upper part is firmly carried out by press fit etc. The aforementioned holder 160 consists of the holding cylinder part 161 and the aforementioned insertion part 162 of the cylindrical shape with which the piezoelectric-device installation opening 167 was sideways formed in the lower part, and wearing immobilization of the aforementioned piezoelectric device 150 is carried out at the lower part of the aforementioned holding cylinder part 161. Outer fitting of the insulating cylinder object 155 whose height (length) is shorter than it is loosely carried out to the periphery, and the electrode plates 151 and 152 of the flat wooden spoon form are stuck on the both-ends surface so that this piezoelectric device 150 is carrying out inner substance cylindrical shape, in addition to drawing 4 (A) and (B) what is necessary may be just to refer to drawing 5 and it may be understood.

[0044]Between the bottom part (the aforementioned insertion part 162) of the aforementioned holding cylinder part 161, and the aforementioned piezoelectric device 150 (the

aforementioned lower electrode 152), The sealant 158 of the anchor ring made of rubber is arranged, and the pressure transfer passage part 163 for transmitting the pressure variation of the fluid of the aforementioned passage and pressure detection room 141 to the aforementioned piezoelectric device 150 runs in the above-mentioned aforementioned insertion part 162. The aforementioned piezoelectric device 150 is forced on the aforementioned sealant 158 by the press nut member 165 thrust into the female screw part 166 formed in the upper part of the aforementioned holding cylinder part 161, and precompression is carried out by predetermined pressure.

[0045]Although discharging of the same fluid as the thing of a first embodiment mentioned above is performed also in the reciprocation type pump 1' of a second embodiment considered as such composition, Since direct transmission of the change of the pressure P of the fluid breathed out from the aforementioned delivery 117 is carried out to the aforementioned piezoelectric device 150 in this embodiment via the aforementioned pressure transfer passage part 163 of the aforementioned insertion part 162 from the aforementioned passage and pressure detection room 141, Like a first above-mentioned embodiment, when it is made to transmit the deforming force by pinch-and-swell [ of the exit passage component 40 ] to the piezoelectric device 50 that is, as compared with the case where it is made to transmit the pressure variation of a fluid to the piezoelectric device 50 indirectly, the aforementioned piezoelectric device 150 reacts sensitively to the pressure variation of a fluid.

[0046]Although the pressure variation of a fluid may be absorbed into the flexible hose etc. which are connected to the aforementioned exit passage component 40 and the output change of the aforementioned piezoelectric device was small and weak in the first above-mentioned mode, In addition to the first pressure regulating valve 120 (what it usually has), the second pressure regulating valve 130 is formed in the aforementioned exit passage component 140 like this mode, Sensitivity [ as opposed to the pressure variation of the fluid of the aforementioned piezoelectric device 150 in it having been made to carry out direct transmission of the pressure variation of the fluid between them to the aforementioned piezoelectric device 150 ] goes up.

[0047]Therefore, in the reciprocation type pump 1' of this embodiment, As shown in drawing 6, it becomes (A) and a thing which differs in the output wave of the aforementioned piezoelectric device 150 in (C) more greatly at the time of (B) and plugging of an outlet side at the time of an oil piece at the time of normal, and from a first embodiment, the certainty and accuracy of the increase of distinctiveness, as a result malfunction detection improve, and reliability increases. As mentioned above, although the embodiment of this invention was explained in full detail, this invention is not limited to the aforementioned embodiment, is a range which does not deviate from the pneuma of invention indicated to Claims, and can perform various change in a design.

[0048]For example, although it has composition which carried out outer fitting of the tubed piezoelectric device (50) to the exit passage component (40) in first above-mentioned embodiment, This invention is not necessarily limited to it, may be replaced with the pressure sensor 100 (thing using a diaphragm) attached to it, for example in the reciprocation type pump 2 of the conventional example shown in drawing 7, and may attach the pressure sensor (piezoelectric sensor) using a piezoelectric device. In this case, it becomes the composition similar to a second embodiment of this invention, and becomes inexpensive as compared with the case where the aforementioned pressure sensor 100 is used in price.

[0049]

[Effect of the Invention]According to this invention, offer of the reciprocation type pump which can detect certainly the abnormalities of the inhalation regurgitation of fluids, such as an oil piece and plugging of an outlet side, under comparatively easy composition using an inexpensive piezoelectric device is attained so that I may be understood from the above explanation.

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[Translation done.]

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**TECHNICAL FIELD**

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[Field of the Invention]This invention relates to the reciprocation type pump it is made to have the inhalation regurgitation of a fluid performed by reciprocating members, such as a piston and a plunger, and relates to what attached the malfunction detection means for detecting the abnormalities that a fluid is not inhaled in particular and that regurgitation feeding is not carried out to the destination.

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**PRIOR ART**

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[Description of the Prior Art]The reciprocation type pump used for the lubrication etc. of the small air-cooling two-cycle gasoline engine (an internal combustion engine is called hereafter) used as the source of power of portable work machines, such as a chain saw, has composition as shown, for example in drawing 7. Hereafter, the reciprocation type pump 2 of a graphic display conventional example is explained briefly. The body part 60 to which inner fitting of the cylinder part 65 in which, as for this reciprocation type pump 2, the admission port 66 and the delivery 67 opened and closed by the ball valve body 75 were formed fundamentally was carried out, The reciprocating member 70 which the rear end part of the plunger rod 71 slidably fitted in the aforementioned cylinder part 65 and this plunger rod 71 becomes from the plunger body 72 by which press fit immobilization was carried out, It has the solenoid 80 which drives the aforementioned reciprocating member 70 allocated in the one end side (a figure right-hand side) of the aforementioned body part 60, and the exit passage component 90 you were made to screw in the other end side (a figure left-hand side screwing part 64) of the aforementioned body part 60.

[0003]The aforementioned ball valve body 75 is energized in the direction which always closes the aforementioned delivery 67 with the carp spring 74 infixed between it and the aforementioned exit passage component 90.

The aforementioned reciprocating member 70 is energized rightward [ of a figure ] by the coil spring 78 infixed between the aforementioned cylinder part 65 and the aforementioned plunger body 72, and is.

[0004]The aforementioned solenoid 80 is inserted between the aforementioned body part 60 and the mounting-and-fixing pipe 84 you were made to screw in the end side periphery, and mounting and fixing is made and carried out.

Externally fitting and fixing of the stopper covering 85 of closed-end cylindrical shape is carried

out to the periphery side of the aforementioned mounting-and-fixing pipe 84.

[0005]The aforementioned solenoid 80 is turned on / (energization magnetization) turned off by drive pulse supplied with a predetermined cycle from a power supply (control device) of the exterior which is not illustrated.

If the aforementioned solenoid 80 is turned OFF from ON, the aforementioned reciprocating member 70, It is made to move rightward [ of a figure ] by energization force of the aforementioned coil spring 78, and the aforementioned PURAJA rod 71 opens the aforementioned admission port 66, While inhaling a fluid (oil for internal combustion engine lubricous) in the valve chest 61 formed between the aforementioned plunger rod 71 and the aforementioned ball valve body 75, the back end collar-like part 73 is made to \*\*\*\* to the aforementioned stopper covering 85 (state shown as a solid line of a figure).

[0006]If the aforementioned solenoid 80 is turned ON from this state, while the aforementioned reciprocating member 70 will be made to move leftward [ of a figure ] by that generating magnetism and the aforementioned PURAJA rod 71 will close the aforementioned admission port 66, The fluid in the aforementioned valve chest 61 is pressed, the aforementioned ball valve body 75 is pushed leftward [ of a figure ], and the aforementioned back end collar-like part 73 of the aforementioned plunger body 72 is made to \*\*\*\* to the impingement baffle 88 made of a synthetic resin stuck on the right end surface of the aforementioned mounting-and-fixing pipe 84. Thereby, the aforementioned delivery 67 is opened and the fluid in the aforementioned valve chest 61 is breathed out at the aforementioned exit passage component 90 side.

[0007]Therefore, while the oil for lubricous in the oil tank which is not illustrated is inhaled by the aforementioned valve chest 61 from the aforementioned admission port 66 via an oil strainer, a suction pipe, etc. by the ON/OFF operation of the aforementioned solenoid 80, for example, Via the check valve 95 allocated in the outlet side of the exit passage 92 currently formed so that it may run through the aforementioned delivery 67, the aforementioned ball valve body 75, and the aforementioned exit passage component 90 from this valve chest 61, and this exit passage 92, the discharge pipes connected to the aforementioned exit passage component 90, etc., Regurgitation feeding is carried out at the sliding portion of the aforementioned internal combustion engine which is a destination. The mark 68 in a figure is an insertion section of the power cord which supplies a drive pulse to the aforementioned solenoid 80 and which is not illustrated.

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[Translation done.]

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**EFFECT OF THE INVENTION**

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[Effect of the Invention]According to this invention, offer of the reciprocation type pump which can detect certainly the abnormalities of the inhalation regurgitation of fluids, such as an oil piece and plugging of an outlet side, under comparatively easy composition using an inexpensive piezoelectric device is attained so that I may be understood from the above explanation.

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[Translation done.]

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## TECHNICAL PROBLEM

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[Problem to be solved by the invention]By the way, in a reciprocation type pump which was described above, oil (fluid) is no longer normally inhaled with plugging of an inlet side, an oil piece (suction of air), etc., Or when plugging arises for piping of an outlet side and abnormalities -- oil is no longer sent to the destination -- arise, to take measures, such as, stopping the aforementioned internal combustion engine for example, that seizure should be prevented and alarming, is desired.

[0009]Therefore, conventionally, a pressure sensor is attached to the aforementioned reciprocating pump, and it considers detecting abnormalities which were described above with this pressure sensor based on the output (detecting signal) of nothing and this pressure sensor so that the pressure fluctuation of that discharge side might be detected.

[0010]As shown in drawing 7, the output port 97 is established in the aforementioned exit passage component 90, and, specifically, it is detected with nothing and this pressure sensor 100 that the pressure fluctuation of that discharge side introduces a part of oil (discharge pressure) of a discharge side into the pressure sensor 100 via rigid pipe 98 grade, for example.

[0011]The thing of the indirect transformation which changes a pressure into other physical quantity (displacement etc.) with a diaphragm etc. conventionally, and takes out an electrical signal as the aforementioned pressure sensor 100 is common, For example, the thing etc. of the system which formed the capacitor of the couple by what stuck the strain gage on the diaphragm, the thing which carried out symmetrical arrangement of a coil and the core to both sides of the diaphragm of a magnetic material, and constituted the magnetic circuit [ \*\*\*\* ], and a conductive diaphragm and the electrode which counters this are marketed.

[0012]The output of the aforementioned pressure sensor 100 synchronizes with ON/OFF (regurgitation and inhalation operation by the aforementioned reciprocating member 70) of the aforementioned solenoid 80 here, as shown in drawing 8, When [ normal ] abnormalities which

were described above have not arisen, Become a waveform as shown in drawing 8 (A), and at the time of an oil piece, As shown in drawing 8 (B), while the stage when change of an output appears is a little (air sink sake) late for the time of normal, when an output becomes small a little and plugging etc. arise in an outlet side, an output becomes very large as shown in drawing 8 (C). Therefore, the classification of the above-mentioned abnormalities is detectable by processing the output (detecting signal) of this pressure sensor 100 by computer.

[0013]However, a pressure sensor which was described above and which is generally marketed, The reciprocation type pump used for the lubrication etc. of the internal combustion engine used as the source of power of portable work machines, such as a chain saw, If it carries out for using as a detection means for detecting abnormalities, such as an oil piece and plugging of an outlet side, Since restrictions were imposed on a place, a space, etc. which there is too expensive a tendency and need to lead fluids (discharge pressure), such as direct oil, to a pressure sensor and in which it is installed, it was difficult actually to attach the aforementioned pressure sensor to the aforementioned reciprocating pump.

[0014]There is a place which was made so that this invention may meet the request which was described above, and is made into the purpose in providing the reciprocation type pump it enabled it to detect certainly under comparatively easy composition in the abnormalities of the inhalation regurgitation of fluids, such as an oil piece and plugging of an outlet side, using an inexpensive detection means.

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[Translation done.]

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**MEANS**

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[Means for solving problem]The reciprocation type pump concerning this invention is characterized by attaching the malfunction detection means which consists of a piezoelectric device which detects the pressure fluctuation of the discharge side that it is made to be performed in the inhalation regurgitation of a fluid by the reciprocating member, and it should be detected whether abnormalities arose in the inhalation regurgitation of the fluid that the aforementioned purpose should be attained. Preferably, the aforementioned piezoelectric device is made ring shape thru/or tubed, and outer fitting is carried out to the exit passage component which is a discharge side of the aforementioned pump.

[0016]In a concrete desirable mode, the reciprocation type pump concerning this invention, While being made to reciprocate the inside of the body part which has the cylinder part in which the admission port and the delivery opened and closed by the valve were formed, and the aforementioned cylinder part and inhaling a fluid from the aforementioned admission port, The aforementioned reciprocating member which extrudes the inhaled fluid from the aforementioned delivery to an exit passage, and the solenoid which drives this reciprocating member are provided.

[0017]In this case, outer fitting of the aforementioned piezoelectric device is preferably carried out to the aforementioned exit passage component, compression maintenance is carried out between the collar-like part and the aforementioned body part which were provided in this exit passage component, and an insulating member is infixed in a still more desirable mode between the aforementioned piezoelectric device, the aforementioned exit passage component, and the aforementioned body part. The fluid which carries out the inhalation regurgitation is suitable for the reciprocation type pump concerning this invention for using it as a lubricating oil pump which is the oil for internal combustion engine lubricous.

[0018]In the desirable mode of the reciprocation type pump concerning this invention considered as composition which was described above, This piezoelectric device to the

inhalation regurgitation of a fluid, using ring shape thru/or a tubed piezoelectric-device simple substance as a malfunction detection means to detect whether abnormalities arose or not in a desirable mode, Outer fitting is carried out to the aforementioned exit passage component, and compression maintenance is carried out by the basis which infixed the insulating member between the collar-like part and the aforementioned body part which were provided in this exit passage component.

[0019]By this by the pressure fluctuation of the fluid of the discharge side of a fluid by which the inhalation regurgitation is carried out with the aforementioned reciprocation type pump, For example, the aforementioned exit passage component carries out pinch-and-swell, the deforming force is transmitted to the aforementioned piezoelectric device via the aforementioned exit passage component and the aforementioned insulating member, this piezoelectric device is made to expand and contract by this, and the output (detecting signal) changes according to the aforementioned pressure fluctuation.

[0020]In this case, if the output of the aforementioned piezoelectric device becomes the fundamentally same thing as the output of the above-mentioned pressure sensor, therefore the output of the aforementioned piezoelectric device is processed by computer etc., it can detect automatically the classification of abnormalities, such as an oil piece and plugging of an outlet side.

[0021]Here the aforementioned ring shape thru/or a tubed piezoelectric device, very easy, since what is necessary is for it to be very inexpensive, and to be marketed as compared with the above-mentioned pressure sensor, and not to lead fluids (discharge pressure), such as direct oil, to the aforementioned piezoelectric device, to carry out outer fitting of the attachment, for example to an exit passage component further, and just to carry out compression maintenance between it and a body part -- it is easy. Thus, according to this invention, the abnormalities of the inhalation regurgitation of fluids, such as an oil piece and plugging of an outlet side, are certainly detectable under comparatively easy composition using an inexpensive piezoelectric device.

[0022]On the other hand, it comprises an another desirable mode of the reciprocation type pump concerning this invention so that direct transmission of the pressure variation of the fluid breathed out from the aforementioned delivery may be carried out to the aforementioned piezoelectric device as the aforementioned malfunction detection means. In this case, the exit passage component connected with the aforementioned delivery side is preferably made tubed [ the passage and pressure detection room was made to penetrate by the inside ], and mounting and fixing of the aforementioned piezoelectric device is carried out to that periphery side.

[0023]The body part which has the cylinder part in which the admission port and the aforementioned delivery were formed in a still more concrete desirable mode, While being

made to reciprocate the aforementioned exit passage component connected with the aforementioned delivery side of this body part via the first pressure regulating valve, the second pressure regulating valve allocated in the downstream of this exit passage component, and the inside of the aforementioned cylinder part and inhaling a fluid from the aforementioned admission port, While providing the aforementioned reciprocating member which extrudes the inhaled fluid from the aforementioned delivery to the aforementioned passage and pressure detection room, and the solenoid which drives this reciprocating member and setting up more highly than the pressure regulation value of the first above-mentioned pressure regulating valve the pressure regulation value of the second above-mentioned pressure regulating valve, It is made as [ carry out / to the aforementioned piezoelectric device / direct transmission of the pressure variation of the fluid of the aforementioned passage and pressure detection room ].

[0024]In the desirable mode of the reciprocation type pump considered as such composition, Since direct transmission of the pressure variation of the fluid breathed out from a delivery is carried out to a piezoelectric device, Like the above-mentioned mode, when it is made to transmit the deforming force by pinch-and-swell [ of an exit passage component ] to a piezoelectric device that is, as compared with the case where it is made to transmit the pressure variation of a fluid to a piezoelectric device indirectly, the aforementioned piezoelectric device reacts sensitively to the pressure variation of a fluid.

[0025]Although the pressure variation of a fluid may be absorbed into the flexible hose etc. which are connected to the aforementioned exit passage component and the output change of the aforementioned piezoelectric device was small and weak in the mode which carries out outer fitting of the above-mentioned ring shape thru/or tubed piezoelectric device to an exit passage component, Like this mode, in addition to the first pressure regulating valve (what it usually has), the second pressure regulating valve is formed in an exit passage component, and sensitivity [ as opposed to the pressure variation of the fluid of the aforementioned piezoelectric device in it having been made to carry out direct transmission of the pressure variation of the fluid between them to the aforementioned piezoelectric device ] goes up. Therefore, in the reciprocation type pump of this mode, the certainty and accuracy of malfunction detection improve and reliability increases.

[0026]

[Mode for carrying out the invention]Hereafter, an embodiment of the invention is described, referring to Drawings. Drawing 1 is a sectional view showing a first embodiment of the reciprocation type pump concerning this invention. The reciprocation type pump 1 of a graphic display is what is used for the lubrication etc. of the small air-cooling two-cycle gasoline engine (an internal combustion engine is called hereafter) used as the source of power of portable work machines, such as a chain saw, It has same composition as fundamentally as the reciprocation type pump 2 of the conventional example shown in drawing 7 mentioned above.

[0027]The reciprocation type pump 1 of \*\*\*\*\* and a graphic display embodiment, The body part 10 to which inner fitting of the cylinder part 15 in which the admission port 16 and the delivery 17 opened and closed by the ball valve body 25 were formed was carried out, The reciprocating member 20 which the rear end part of the plunger rod 21 slidably fitted in the aforementioned cylinder part 15 and this plunger rod 21 becomes from the plunger body 22 by which press fit immobilization was carried out, It has the solenoid 30 which drives the aforementioned reciprocating member 20 allocated in the one end side (a figure right-hand side) of the aforementioned body part 10, and the exit passage component 40 you were made to screw in the other end side (a figure left-hand side screwing part 14) of the aforementioned body part 10.

[0028]The aforementioned ball valve body 25 is energized in the direction which always closes the aforementioned delivery 17 with the carp spring 24 infixed between it and the aforementioned exit passage component 40, and the aforementioned reciprocating member 20, By the coil spring 28 infixed between the aforementioned cylinder part 15 and the aforementioned plunger body 22, it is energized rightward [ of the figure ], and is.

[0029]The aforementioned solenoid 30 is inserted between the aforementioned body part 10 and the mounting-and-fixing pipe 34 you were made to screw in the end side periphery, and mounting and fixing is made and carried out, and externally fitting and fixing of the stopper covering 35 of closed-end cylindrical shape is carried out to the periphery side of the aforementioned mounting-and-fixing pipe 34.

[0030]The aforementioned solenoid 30 is turned on / (energization magnetization) turned off by the drive pulse supplied with a predetermined cycle from the power supply (control device) of the exterior which is not illustrated, If the aforementioned solenoid 30 is turned OFF from ON, the aforementioned reciprocating member 20, It is made to move rightward [ of a figure ] by the energization force of the aforementioned coil spring 28, and the aforementioned PURAJA rod 21 opens the aforementioned admission port 16, While inhaling a fluid (oil for internal combustion engine lubricous) in the valve chest 11 formed between the aforementioned plunger rod 21 and the aforementioned ball valve body 25, the back end collar-like part 23 is made to \*\*\*\* to the aforementioned stopper covering 35 (state shown as the solid line of a figure).

[0031]If the aforementioned solenoid 30 is turned ON from this state, while the aforementioned reciprocating member 20 will be made to move leftward [ of a figure ] by that generating magnetism and the aforementioned PURAJA rod 21 will close the aforementioned admission port 16, The fluid in the aforementioned valve chest 11 is pressed, the aforementioned ball valve body 25 is pushed leftward [ of a figure ], and the aforementioned back end collar-like part 23 of the aforementioned plunger body 22 is made to \*\*\*\* to the impingement baffle 38 made of a synthetic resin stuck on the right end surface of the aforementioned mounting-and-

fixing pipe 34. Thereby, the aforementioned delivery 17 is opened and the fluid in the aforementioned valve chest 11 is breathed out at the aforementioned exit passage component 40 side.

[0032]Therefore, while the oil for lubricous in the oil tank which is not illustrated is inhaled by the aforementioned valve chest 11 from the aforementioned admission port 16 via an oil strainer, a suction pipe, etc. by the ON/OFF operation of the aforementioned solenoid 30, for example, Via the check valve 45 allocated in the outlet side of the exit passage 42 currently formed so that it may run through the aforementioned delivery 17, the aforementioned ball valve body 25, and the aforementioned exit passage component 40 from this valve chest 11, and this exit passage 42, the discharge pipes connected to the aforementioned exit passage component 40, etc., Regurgitation feeding is carried out at the sliding portion of the aforementioned internal combustion engine which is a destination.

[0033]In addition to the aforementioned composition, by this embodiment, whether abnormalities arose in the inhalation regurgitation of the oil for lubricous as a malfunction detection means to detect, The commercial tubed piezoelectric device 50 between the collar-like part 43 which carried out outer fitting to the aforementioned exit passage component 40, and was provided in this exit passage component 40, and the collar-like part 13 provided in the aforementioned body part 10, Compression maintenance is carried out via the tubed inner circumference insulating member 55 and the disc-like end-face insulating members 56 and 57 so that performance of the aforementioned piezoelectric device 50 may not be spoiled by generating of leak etc.

[0034]The output (detecting signal) of this piezoelectric device 50 is taken out via the lead (not shown) which was silver-welded or was soldered to that end surface. This piezoelectric device 50 is pre-compressed by predetermined pressure between the aforementioned collar-like parts 43-13. The mark 18 in a figure is an insertion section of the power cord which supplies a drive pulse to the aforementioned solenoid 30 and which is not illustrated.

[0035]In the reciprocation type pump 1 of this embodiment considered as such composition, By pressure fluctuation in case the oil for lubricous is breathed out (when the aforementioned solenoid 30 is turned ON), The aforementioned exit passage component 40 carries out pinch-and-swell, the deforming force is transmitted to the aforementioned piezoelectric device 50 via the aforementioned exit passage component 40 and the aforementioned insulating members 55, 56, and 57, this piezoelectric device 50 is made to expand and contract by this, and the voltage (output) proportional to the degree (variation speed) of the elasticity occurs.

[0036]In this case, the output of the aforementioned piezoelectric device 50 fundamentally like [ as shown in drawing 2 ] the output (drawing 8) of the pressure sensor 100 of the above-mentioned conventional example, When [ normal ] abnormalities which were described above have not arisen synchronizing with ON/OFF (regurgitation and inhalation operation by the

aforementioned reciprocating member 20) of the aforementioned solenoid 30, Become a waveform as shown in drawing 2 (A), and at the time of an oil piece, As shown in drawing 2 (B), while the stage when change of an output appears is a little (air sink sake) late for the time of normal, when amplitude becomes small a little and plugging etc. arise in an outlet side, amplitude becomes very large as shown in drawing 2 (C). Therefore, abnormalities, such as an oil piece and plugging of an outlet side, are automatically detectable by processing the output (detecting signal) of this piezoelectric device 50 by computer.

[0037]As compared with the pressure sensor 100 of the above-mentioned conventional example, the front tubed piezoelectric device 50 is very inexpensive, and is marketed here, very easy, since what is necessary is not to lead fluids (discharge pressure), such as direct oil, to the aforementioned piezoelectric device 50, to carry out outer fitting of the attachment to the aforementioned exit passage component 40 further, and just to carry out compression maintenance between it and the aforementioned body part 10 -- it is easy. Thus, in the reciprocation type pump 1 of this embodiment, the abnormalities of the inhalation regurgitation of fluids, such as an oil piece and plugging of an outlet side, are certainly detectable under comparatively easy composition using an inexpensive piezoelectric device.

[0038]Drawing 3 is a sectional view showing a second embodiment of the reciprocation type pump concerning this invention. The reciprocation type pump 1' of a graphic display has same composition as fundamentally as the reciprocation type pump 1 of a first embodiment shown in drawing 1 mentioned above, it gives identical codes to the same functional division as a first embodiment, omits duplication explanation to below, and explains a point of difference to it preponderantly.

[0039]The reciprocation type pump 1' of this embodiment is constituted so that direct transmission of the pressure variation of the fluid breathed out from the delivery 117 may be carried out to the piezoelectric device 150 as a malfunction detection means. The exit passage component 140 connected with the aforementioned delivery 117 side is made tubed [ the passage and pressure detection room 141 was made to penetrate by the inside ], and mounting and fixing of the aforementioned piezoelectric device 150 is carried out to the periphery side.

[0040]The body part 10' which has in detail the cylinder part 115 in which the admission port 116 and the aforementioned delivery 117 were formed. The aforementioned exit passage component 140 connected with the aforementioned delivery 117 side of this body part 10' via the first pressure regulating valve 120, While being made to reciprocate the second pressure regulating valve 130 allocated in the downstream of this exit passage component 140, and the inside of the aforementioned cylinder part 115 and inhaling a fluid from the aforementioned admission port 116, The aforementioned reciprocating member 20 which extrudes the inhaled fluid from the aforementioned delivery 117 to the aforementioned passage and pressure

detection room 141, and the solenoid 30 which drives this reciprocating member 20 are provided.

[0041]The pump is usually equipped with the first above-mentioned pressure regulating valve 120, and it consists of the ball valve body 125 and the helical compression spring 124 which energizes this in the closed direction. To it, the second above-mentioned pressure regulating valve 130 was newly attached, and consists of the ball valve body 135 which opens and closes the second delivery 147 of the downstream end of the aforementioned passage and pressure detection room 141, and the helical compression spring 134 which energizes this in the closed direction. The joint member 145 for connecting hose is made to screw in downstream one end of the aforementioned exit passage component 140, the compression amount of the aforementioned helical compression spring 134 is adjusted on it by the amount of bell and spigots of this joint member 145, and, thereby, the pressure regulation value of the aforementioned pressure regulating valve 130 is set to it.

[0042]Here, the pressure regulation value of the second above-mentioned pressure regulating valve 130 is set up more highly than the pressure regulation value of the first above-mentioned pressure regulating valve 120. In other words, it is set up so that the direction of the pressure to which the second above-mentioned pressure regulating valve opens the second above-mentioned delivery 147 from the pressure which the first above-mentioned pressure regulating valve 120 opens aforementioned delivery 117 may become high.

[0043]As the section periphery of the aforementioned exit passage component 140 is shown in drawing 4 (A), it has double-sided parallel chamfering type, and insertion immobilization of the insertion part 162 of the holder 160 which holds the aforementioned piezoelectric device 150 to the intussusceptum 144 provided in the center-section upper part is firmly carried out by press fit etc. The aforementioned holder 160 consists of the holding cylinder part 161 and the aforementioned insertion part 162 of the cylindrical shape with which the piezoelectric-device installation opening 167 was sideways formed in the lower part, and wearing immobilization of the aforementioned piezoelectric device 150 is carried out at the lower part of the aforementioned holding cylinder part 161. Outer fitting of the insulating cylinder object 155 whose height (length) is shorter than it is loosely carried out to the periphery, and the electrode plates 151 and 152 of the flat wooden spoon form are stuck on the both-ends surface so that this piezoelectric device 150 is carrying out inner substance cylindrical shape, in addition to drawing 4 (A) and (B) what is necessary may be just to refer to drawing 5 and it may be understood.

[0044]Between the bottom part (the aforementioned insertion part 162) of the aforementioned holding cylinder part 161, and the aforementioned piezoelectric device 150 (the aforementioned lower electrode 152), The sealant 158 of the anchor ring made of rubber is arranged, and the pressure transfer passage part 163 for transmitting the pressure variation of

the fluid of the aforementioned passage and pressure detection room 141 to the aforementioned piezoelectric device 150 runs in the above-mentioned aforementioned insertion part 162. The aforementioned piezoelectric device 150 is forced on the aforementioned sealant 158 by the press nut member 165 thrust into the female screw part 166 formed in the upper part of the aforementioned holding cylinder part 161, and precompression is carried out by predetermined pressure.

[0045]Although discharging of the same fluid as the thing of a first embodiment mentioned above is performed also in the reciprocation type pump 1' of a second embodiment considered as such composition, Since direct transmission of the change of the pressure P of the fluid breathed out from the aforementioned delivery 117 is carried out to the aforementioned piezoelectric device 150 in this embodiment via the aforementioned pressure transfer passage part 163 of the aforementioned insertion part 162 from the aforementioned passage and pressure detection room 141, Like a first above-mentioned embodiment, when it is made to transmit the deforming force by pinch-and-swell [ of the exit passage component 40 ] to the piezoelectric device 50 that is, as compared with the case where it is made to transmit the pressure variation of a fluid to the piezoelectric device 50 indirectly, the aforementioned piezoelectric device 150 reacts sensitively to the pressure variation of a fluid.

[0046]Although the pressure variation of a fluid may be absorbed into the flexible hose etc. which are connected to the aforementioned exit passage component 40 and the output change of the aforementioned piezoelectric device was small and weak in the first above-mentioned mode, In addition to the first pressure regulating valve 120 (what it usually has), the second pressure regulating valve 130 is formed in the aforementioned exit passage component 140 like this mode, Sensitivity [ as opposed to the pressure variation of the fluid of the aforementioned piezoelectric device 150 in it having been made to carry out direct transmission of the pressure variation of the fluid between them to the aforementioned piezoelectric device 150 ] goes up.

[0047]Therefore, in the reciprocation type pump 1' of this embodiment, As shown in drawing 6, it becomes (A) and a thing which differs in the output wave of the aforementioned piezoelectric device 150 in (C) more greatly at the time of (B) and plugging of an outlet side at the time of an oil piece at the time of normal, and from a first embodiment, the certainty and accuracy of the increase of distinctiveness, as a result malfunction detection improve, and reliability increases. As mentioned above, although the embodiment of this invention was explained in full detail, this invention is not limited to the aforementioned embodiment, is a range which does not deviate from the pneuma of invention indicated to Claims, and can perform various change in a design.

[0048]For example, although it has composition which carried out outer fitting of the tubed piezoelectric device (50) to the exit passage component (40) in first above-mentioned

embodiment, This invention is not necessarily limited to it, may be replaced with the pressure sensor 100 (thing using a diaphragm) attached to it, for example in the reciprocation type pump 2 of the conventional example shown in drawing 7, and may attach the pressure sensor (piezoelectric sensor) using a piezoelectric device. In this case, it becomes the composition similar to a second embodiment of this invention, and becomes inexpensive as compared with the case where the aforementioned pressure sensor 100 is used in price.

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[Translation done.]

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**DESCRIPTION OF DRAWINGS**

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[Brief Description of the Drawings]

[Drawing 1]The sectional view showing a first embodiment of the reciprocation type pump concerning this invention.

[Drawing 2]The graph with which explanation of the output change at the time of the time of normal and the abnormalities of the piezoelectric device used for the reciprocation type pump shown in drawing 1 is presented.

[Drawing 3]The sectional view showing a second embodiment of the reciprocation type pump concerning this invention.

[Drawing 4](A) is an IV(A)-IV(A) arrowed cross-section figure of drawing 3, and (B) is an IV(B)-IV(B) arrowed cross-section figure of drawing 3.

[Drawing 5]The perspective view showing the piezoelectric element unit used for the reciprocation type pump shown in drawing 3.

[Drawing 6]The graph with which explanation of the output change at the time of the time of normal and the abnormalities of the piezoelectric device used for the reciprocation type pump shown in drawing 3 is presented.

[Drawing 7]The sectional view showing an example of the conventional reciprocation type pump.

[Drawing 8]The graph with which explanation of the output change at the time of the time of normal and the abnormalities of the pressure sensor used for the reciprocation type pump shown in drawing 7 is presented.

[Explanations of letters or numerals]

1 and 1' reciprocation type pump

10 and 10' body part

15 Cylinder part

16 Admission port

17 Delivery  
20 Reciprocating member  
25 Ball valve body  
30 Solenoid  
40 Exit passage component (discharge side)  
42 Exit passage  
43 Collar-like part  
50 Piezoelectric device (malfunction detection means)  
55-57 Insulating member  
115 Cylinder part  
116 Admission port  
117 Delivery  
120 The first pressure regulating valve  
130 The second pressure regulating valve  
140 Exit passage component  
141 Passage and pressure detection room  
150 Piezoelectric device (malfunction detection means)

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[Translation done.]

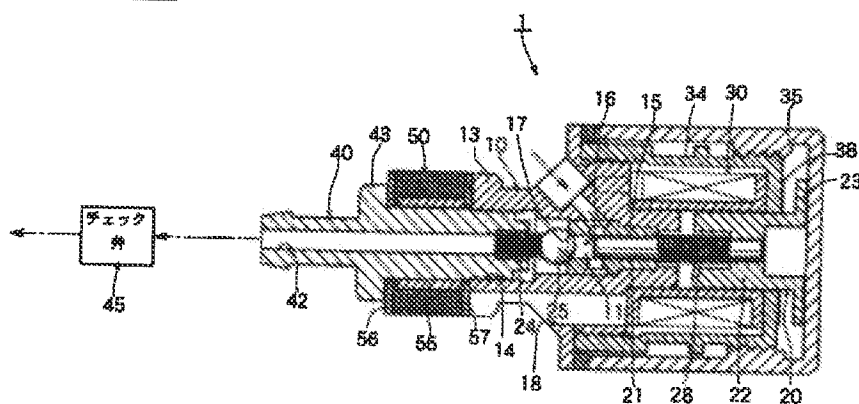
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## DRAWINGS

[Drawing 1]

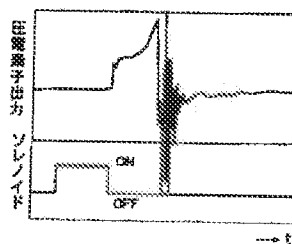
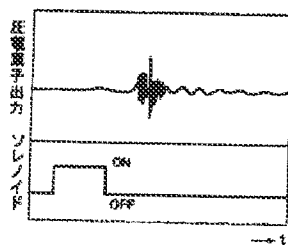
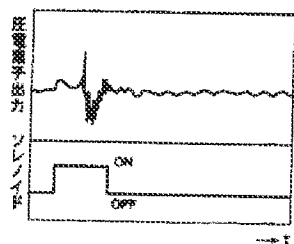


[Drawing 2]

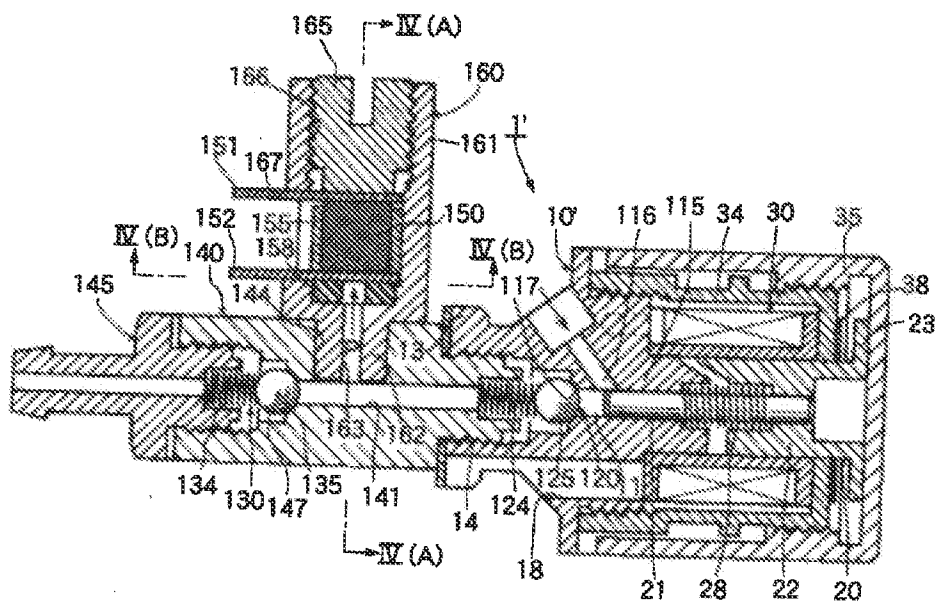
(A) 正常

(B) オイル切れ

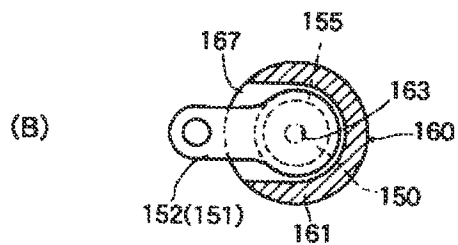
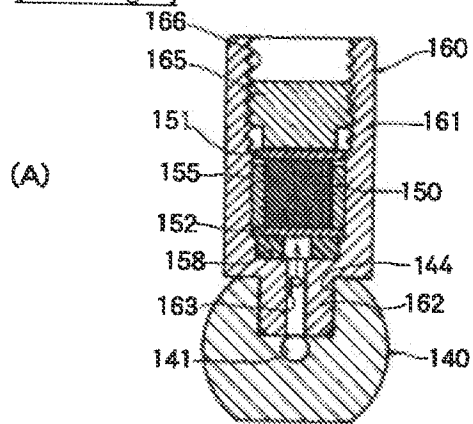
(C) 出口側の詰まり



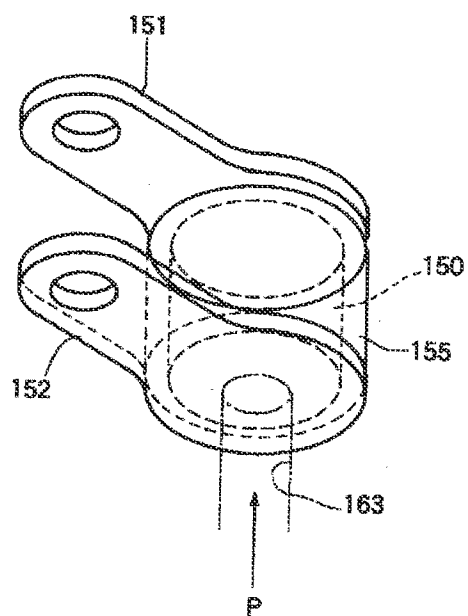
[Drawing 3]



[Drawing 4]



[Drawing 5]

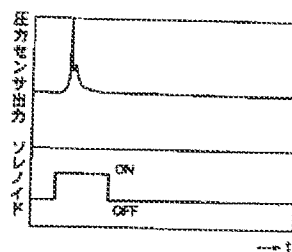
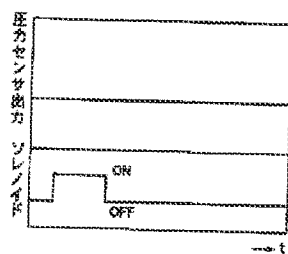
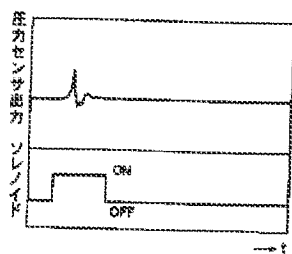


[Drawing 6]

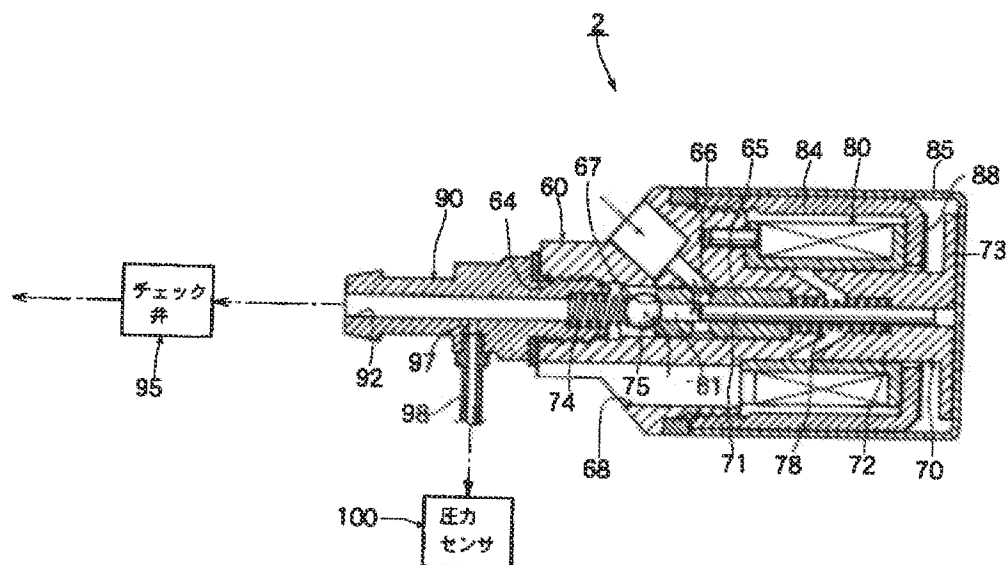
(A) 正常

(B) オイル切れ

(C) 出口側の詰まり



[Drawing 7]

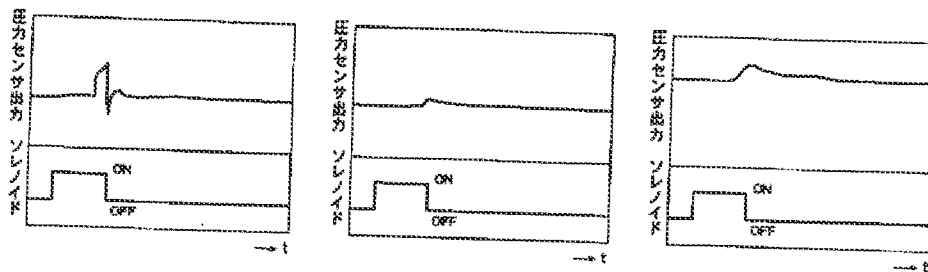


[Drawing 8]

(A) 正常

(B) オイル切れ

(C) 出口側の詰まり



[Translation done.]